Expedition MANGAN 2021 with MV ISLAND PRIDE (04.04.2021 – 15.05.2021)

Weekly report No. 5 (26 April to 02 May 2021)

It has been an unpredictable week on the MV ISLAND PRIDE, with many changes in plan taking place since we received the notification from the MV NORMAND ENERGY that the mechanical termination of Patania II had been disconnected during its ascent from a routine validation test on the seafloor last Sunday morning. The good news from a technical perspective was that Patania II had landed upright on the seafloor and a detailed visual inspection of the machine by ISLAND PRIDE's ROV on Tuesday evening showed it to be in good physical state. By this time, many erroneous statements on what may and may not have happened to GSR's nodule collector were starting to appear in journals, facebook and on twitter: ranging from Patania II being out of control and stuck in the seafloor to GSR trying to recover it using the RAINBOW WARRIOR. Several statements used words such as "catastrophic" and "dramatic". Neither are the case. In a well-planned joint mission involving both ships and their capable crews, Patania II was recovered by ISLAND PRIDE and "handed over" to the crane of NORMAND ENERGY at 2000 m water depth for successful transfer to the surface vessel on Thursday 29 April.

The successful recovery of Patania II is advertently linked to our joint aim and commitment to carrying out a collector test of similar dimension and its scientific monitoring in the German contract area, despite the delays that the incident has caused and several conditional uncertainties that remain to be solved before Patania II can be redeployed.

Without a prognosis on the further fate of Patania II last Sunday, we made the decision to stay in the impacted Belgian area a few days longer than originally planned in order to continue our post-impact assessments and secure a more complete monitoring of the successful test there. We thus continued with a sediment and water sampling programme on Monday and Tuesday using multicorer, boxcorer and CTD-rosette to obtain more samples especially for biological, microbiological and geochemical analyses from differently affected areas in space and time. An ROV dive was dedicated to carrying out more micro-profiling to measure oxygen fluxes in the topmost seafloor sediments in the impacted trial area a week after the impact and take further push cores within and beyond the collector tracks. All remaining sensors for measuring the sediment concentrations in the plume were picked up from the seafloor on Wednesday.

With the successful recovery of Patania II on Thursday and the information at hand that she was in good state and revivable for a test in the German contract area, we ended our work in the Belgian contract area on Thursday evening. After picking up the NIOZ Bottom boundary lander (BoBo) in the remaining hour of daylight straight after the Patania rescue action, we headed off on an approximately 2-day transit to the German trial area, 535 nautical miles to the east, where we arrived on Saturday afternoon.

Rainy weather greeted us in the German contract area, the first rain we have seen since our arrival in San Diego on 23 March. BoBo was prepared for her next deployment at about 1.5 km away from the planned German trial site. The lander is equipped with current and turbidity sensors, a hydrophone and a sediment trap, that will give us an indication of the far-field development of the sediment plume. In the Belgian contract area, we had seen by ROV a dense sediment plume with low visibility that had reached all the way to BoBo's deployment site, also about 1.5 km away from the source. Nevertheless, the turbidity sensors on BoBo only showed weak signals of the plume and the sediment trap contains lower sediment quantities than expected. Hardly any sediment blanketing of the nodules was observed at this site in post-impact photos made by AUV. This suggests that low visibility in the plume relates to lower than expected sediment concentration in the water (high dilution of the plume into surrounding waters). Alternatively, this plume does not settle out of the water column quickly but spreads into the far-field as shown by AUV data (see last week's report), where we can no longer track its fate. With all the collected AUV data as well as the oceanographic data from the sensor array on the seafloor, we believe that we have now obtained a substantial dataset to test and further develop models that can predict the fate of this far-field component of the sediment plume.

An ROV dive last night was used to obtain micro-profiler data from the German trial site and to position 14 platforms with hydroacoustic and optical sensors onto the seafloor at different distances from the test site. This morning, the AUV was sent on its first mission in the German area to carry out a high-resolution photographic survey of the trial area (photomosaicking) and, in stripes that are several hundreds of meters apart, its far-field surroundings up to about 5 km away. This afternoon, with sunny and calm weather, we successfully retrieved one BGR Ocean Bottom Mooring carrying current profilers and one 600-m-long BGR mooring comprised of two sediment traps and three current profilers. Both had been deployed close to the trial area two years ago during the SO268 expedition to monitor long-term natural particle fluxes and currents in the direct vicinity of the trial site. Tomorrow, two further moorings will be retrieved, and five new moorings will be deployed to monitor the test as well as natural background conditions until the BGR picks them up again in 2022.

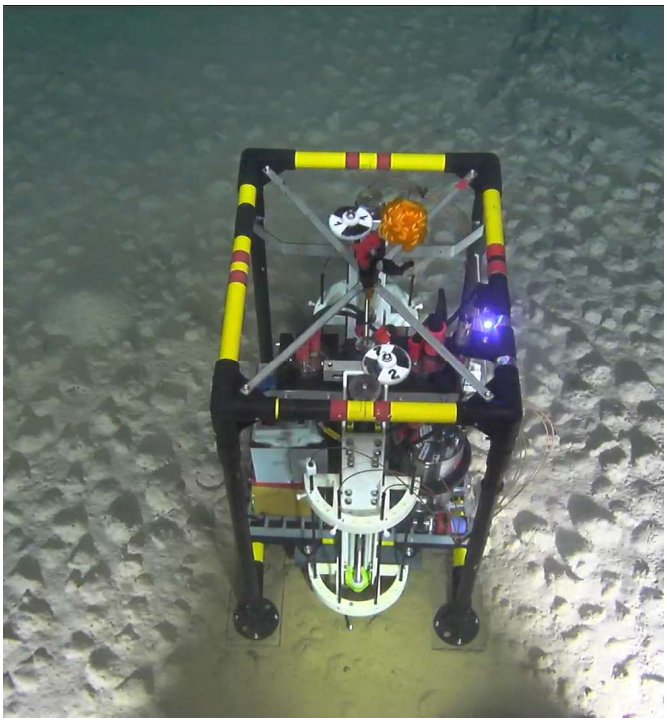
For the moment, GSR is sailing full-speed into calmer waters close to the coast of Mexico, where sea state conditions should allow a safe repositioning of Patania II from the aft of the vessel back into the A-frame. As this takes time, the start of a potential trial with Patania II in the German contract area has been set at 07 May, with a duration similar to the test in the Belgian area (~40 hours). This leaves us with very little time to carry out post-impact monitoring and is the price we have to pay for technical issues that so often interfere with complicated, high-tech operations in the harsh environment of the deep sea. We shall prepare accordingly and can only hope that Patania II will be on site and ready to execute this long-planned trial before we ourselves have to leave the area on the evening of 10 May.

On behalf of all participants, I send you sunny greetings from onboard the ISLAND PRIDE,

Annemiek Vink

Massimilliano Molari of Max-Planck Institute Bremen (MPI) preparing to take samples of nodules for microbiological analyses after a box core sample was taken in the Belgian area. Photos: Thomas Aigner.

MV NORMAND ENERGY in close proximity to MV ISLAND PRIDE during the Patania II rescue operation. Photo: Mirja Bardenhagen.



Left: one of MPI's micro-profilers for the determination of oxygen fluxes as a measure of microbial activity and organic carbon turnover in the sediment, placed in a heavy sedimentation nodule area close to the Belgian trial area © BGR. Right: retrieval of a 25-m-long Ocean Bottom Mooring using the heavy weight crane of ISLAND PRIDE to recover it in one piece. Photo: Annemiek Vink.